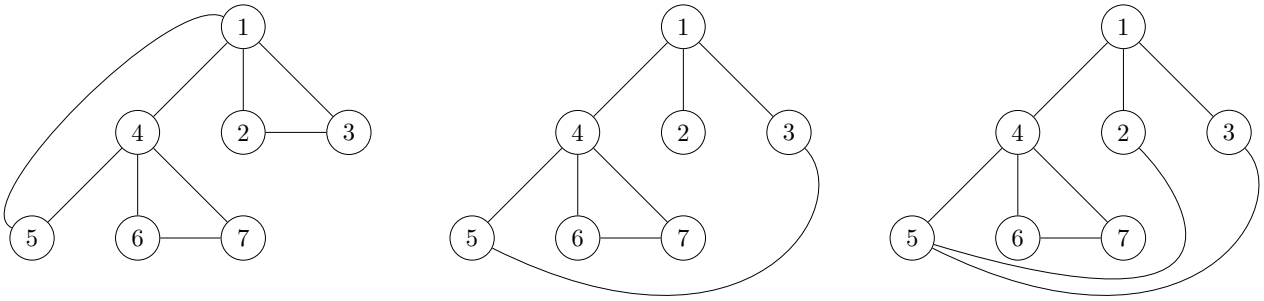
The Hanged Man

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

Claudette Morel is a botanist who is passionate about studying various plants. One day, while studying roses, she accidentally pricked her hand on a thorn. With her botany knowledge, she knew how to treat the wound, but more importantly, she wanted to prevent such incidents from happening again. To achieve this, she came up with a solution: make the rose thorns disappear.

The rose can be viewed as a tree with n nodes. To make the rose thornless, Claudette Morel can add several edges to the graph, as long as the addition does not create multiple edges or self-loops. However, she cannot add new nodes to the graph.

A simple graph is *thornless* if and only if each edge appears in exactly one simple cycle. A simple cycle is defined as a cycle that does not contain any repeated nodes (except for the starting and ending node being the same). The following illustrations explain what is a thornless graph and what is not.



- Left: This is a thornless graph.
- Middle: This is not a thornless graph because the edge $(1, 2)$ does not appear in any simple cycle.
- Right: This is not a thornless graph because the edge $(1, 2)$ appears in both cycles $1 \sim 2 \sim 5 \sim 4 \sim 1$ and $1 \sim 2 \sim 5 \sim 3 \sim 1$.

Now, Claudette Morel has taken out her roses, and you are tasked with analyzing whether they can be transformed into a thornless graph.

Input

The input consists of multiple test cases. The first line contains a single integer T ($1 \le T \le 10^5$) — the number of test cases. The description of the test cases follows.

The first line contains one integer n ($2 \le n \le 3 \cdot 10^5$) — the number of nodes in the tree.

Each of the following $n - 1$ lines contains two integers u_i and v_i ($1 \le u_i, v_i \le n$), indicating that (u_i, v_i) is an edge on the tree.

It is guaranteed that the sum of n among T test cases does not exceed $3 \cdot 10^5$.

Output

For each test case, if the tree cannot be transformed into a thornless graph, output -1.

Otherwise, on the first line, output k ($0 \le k \le n$) — the number of edges you added.

In the following k lines, each line should contain two integers x_i and y_i ($1 \le x_i, y_i \le n$) — the edges you added. Note that after adding edges, multiple edges and self-loops are not allowed. If there are multiple solutions, print any.

Example

standard input	standard output
3 4 1 2 2 3 2 4 7 1 2 1 3 1 4 4 5 4 6 4 7 6 1 2 2 3 2 4 1 5 5 6	-1 3 1 5 2 3 6 7 2 6 2 4 3

Note

The left graph in the statement shows the second test case.